Revised August 26, 2008

Suggested method to calculate storage volume for check dams

$$V(yd^3) = \frac{1}{81}\left(d\left(\frac{(b_2 + \left(\frac{1}{S_1} + \frac{1}{S_2}\right)(h)) + b_2}{2} \right)\right)\left(\frac{h}{S_0} + x\right)$$

For Rip rap ditch checks, use:	x = 1.2'	h = 0.6’
For a baled straw ditch check	x = 0	h = 0.6’
For a fabric check dam use	x = 7’	h = 0.6’

Storage volumes are based on the volume at 50% height of the ditch. See below for derivation of this formula

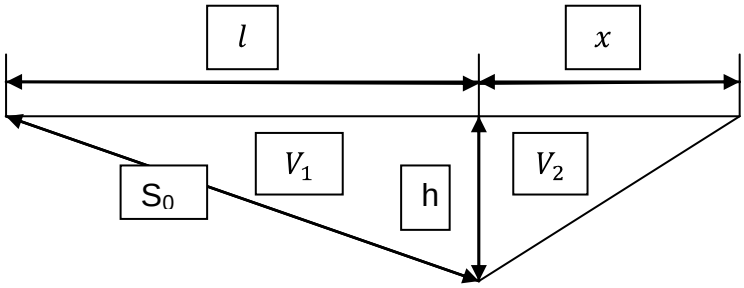

Figure 1: Profile View of the Ditch

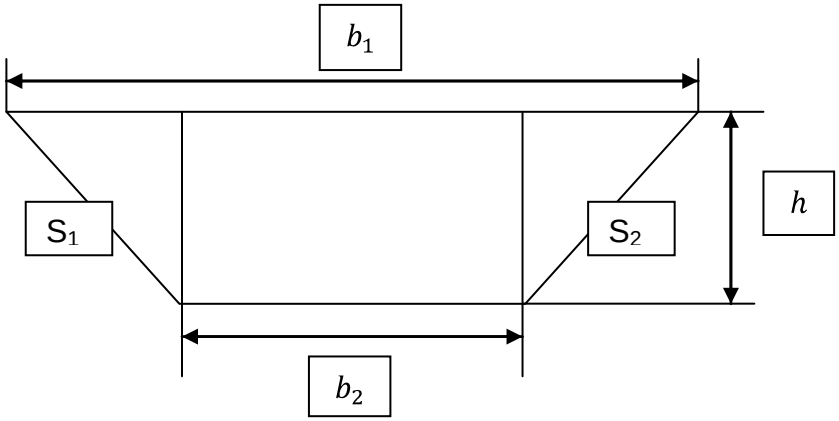

Figure 2: Cross Section View of the Ditch at the upstream toe of the ditch check (A_1)

V_1 – Sediment storage volume above the ditch
V_2 – Sediment storage volume alongside the ditch check
S_0 – Longitudinal slope of the ditch measured in percent

h – height of the ditch check measured at the lowest point.
S_1 – Front slope of the ditch measured in percent
S_2 – Back slope of the ditch measured in percent
b_1 – Top width of the storage volume, measured at the top of the ditch check.
b_2 – width of the ditch
l – distance the sediment can be stored over the ditch measured horizontally from the toe of the ditch check
x – distance the sediment can be stored over the ditch check.
A_1 – total cross sectional area of the storage area measured at the toe of the ditch check.

Derivation of the check dam storage formula.

$V_{Pyramid} = \frac{1}{3} l_{base} w_{base} h$

Volume of a pyramid (This formula was used as a general formula for calculating the volume of a ditch)

$l(ft) = \frac{h}{S_0\ (\%)}$

Formula used to find l with varying slope

$V_1 = \frac{1}{3} l(A_1)$

$V_2 = \frac{1}{3} x(A_1)$

The volume of storage is broken into two trapezoidal pyramids.

$A_1 = d\left(\frac{b_1 + b_2}{2}\right)$

A_1 is equal to the cross sectional area of the ditch at the toe of the ditch check

$b_1 = b_2 + \left(\frac{1}{S_1} + \frac{1}{S_2}\right)(h)$

S_1 and S_2 are are the front and back slopes of the ditch expressed in percent

$V = V_1 + V_2$

Total Volume Equation

$V = \frac{1}{3} l A_1 + \frac{1}{3} x A_1$

Total Volume Equation after substituting in V_1 and V_2

$V = \frac{1}{3} A_1 (l + x)$

Total Volume Equation in reduced form

$V(ft^3) = \frac{1}{3}\left(d\left(\frac{b_1+b_2}{2}\right)\right)(l + x)$

Substitute for A1

$V(ft^3) = \frac{1}{3}\left(d\left(\frac{(b_2+\left(\frac{1}{S_1}+\frac{1}{S_2}\right)(h))+b_2}{2}\right)\right)\left(\frac{h}{S_0} + x\right)$

Substituting for b1 and l

$V(yd^3) = \frac{1}{81}\left(d\left(\frac{(b_2+\left(\frac{1}{S_1}+\frac{1}{S_2}\right)(h))+b_2}{2}\right)\right)\left(\frac{h}{S_0} + x\right)$

Converting to $V(yd^3)$

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